Sonic Studio NoNOISE 3

User Manual

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Mac

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Chapter 1.....NoNOISE 3 Introduction

The NoNOISE 3 Audio Units® and VST® plug-in is the new, updated version of our award-winning noise reducer for the Mac that can rescue both old and new recordings alike. Broadband noise, whether white, pink or brown in spectrum, is one of the most common forms of audio degradation. Noise can be introduced from any of a number of sources, including the modulation and asperity noise inherent in analog tape recording and Johnson or thermal noise from microphones, preamps, and other analog signal processing equipment. NoNOISE 3 is a single ended broadband noise reducer that, unlike less refined products, can suppress or eliminate broadband noise with little or no audible artifacts, even at extreme settings.

NoNOISE 3 is one part of Sonic Studio's NoNOISE restoration product line. It is an updated and improved version of the legendary restoration technology from Sonic Solutions. The Grammy® award winning NoNOISE technology set the standard by which all other restoration toolsets are judged. And, because NoNOISE 3 is built on the Sonic Studio Engine, you can be certain that the processing is double-precision resulting in less quantization noise, no timbral shifts and dramatically lower distortion and artifacts.

1.1 Overview

NoNOISE 3 is designed to address audio contamination from broadband or wide-band noise sources. Whether the problems are electrical or acoustical, NoNOISE 3 can vastly improve perceived fidelity and provide a quiet, more uniform noise floor to your recordings without objectionable artifacts or any shift in timbre or room tone.

NoNOISE 3 is effective on these and other types of noise:

- Modulation and asperity noise on analog magnetic recordings
- Obtrusive grain–induced noise in optical motion picture soundtracks
- Johnson-Nyquist noise in analog signal chains
- Acoustical noises from engines, HVAC units, wind, water, insects & other sources
- Colorless suppression of excessive reverberation

Noise removal is easy:

1) Define small sample of noise - generally 1/2 second is good. Set your audio app to play a second or two before the noise.

2) Play the file and press the Take button during the section you defined as noise. Save that estimate that appears.

3) Adjust Interpolation Bins to taste. Use the NoNoise In/Out button to compare processed vs. original.

4) You may need to export or 'bounce' your files to apply NoNOISE 3 processing to a finished file. Note that NoNOISE 3 is a non-destructive process. It does not alter your original files.

Scope of this User Manual

This User Manual describes the functionality of Sonic Studio's NoNOISE 3 plug-in for use in both soundBlade and other host applications that support Audio Units or VST plug-in architecture.

Notes Overview

These notes add more information or reinforce concepts about a particular topic or subject.

Learn Overview

The learn notes are meant to provide 'how to' or specifics about a topic or subject.

Chapter 2..... NoNOISE 3 Installation & Activation

2.1 Minimum Software Requirements

- Intel Apple Macintosh
- Mac OS 10.6.8 or newer
- Spare USB port for iLok Smart Key

Note: NoNOISE 3 will not run on Power PC Macs or Windows®.

Learn: NoNOISE 3 is supported on both 32 bit and 64 bit host applications. The same Audio Units or VST plug-in automatically runs in either 32 or 64 bit mode, depending on your audio application's settings.

2.2 Installing NoNOISE 3

Run the NoNOISE3_Installer.pkg and follow the on-screen instructions. This plug-in is installed in these locations:

Audio Units version: /Library/Audio/Plug-Ins/Components

VST version: /Library/Audio/Plug-Ins/VST

2.3 Activating NoNOISE 3 Via iLok

2.3.1 iLok License Installation

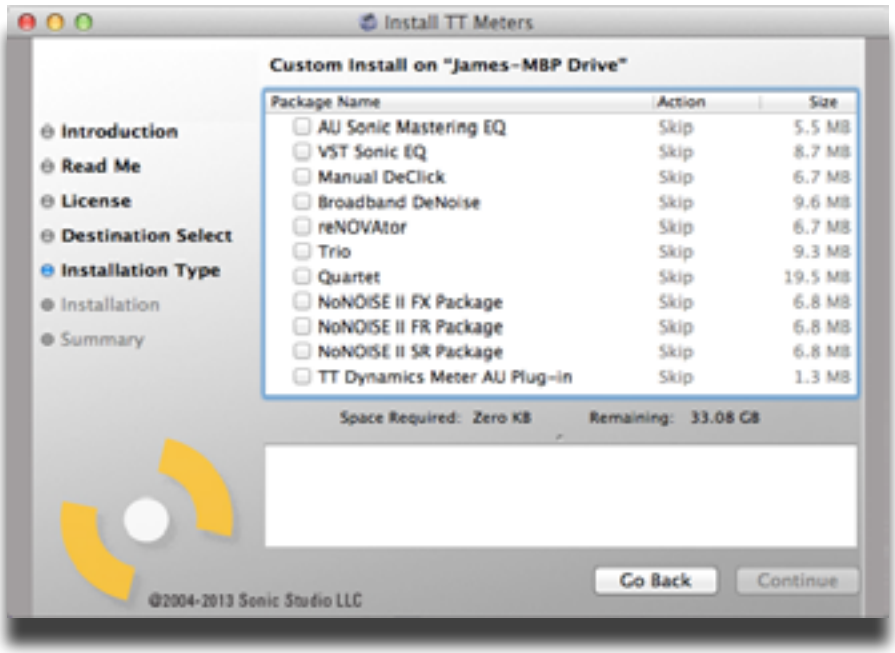
When you purchase any Sonic Studio option, you are delivered an Activation Code for each product via email. To active your licenses on your iLok:

1. Copy your Activation Code
2. Launch your iLok License Manager app
3. Select 'Redeem License Code' from the View menu
4. Paste your code into the field proved, then follow the on-screen instructions to download your iLok license for soundBlade from their servers to your iLok.

2.3.2 soundBlade Option Installation

For audio apps other than soundBlade, this step is not required.

For NoNOISE 3 to be enabled for use in soundBlade, the installation of certain software and a Sonic Studio Options File is required. Running the 'Install Sonic Studio Options.mpkg' located in your soundBlade app folder's Sonic Options folder, installs the necessary software for each of these options and enables the options that you have licenses for on your iLok to be recognized by soundBlade.



Select the options you want to install in the Sonic Options Installer Window.

3.1 User Interface Overview

The NoNOISE 3 window, with its 14 controls discussed below, has buttons to open an Estimate file, to open and save the controls and their parameters, to bypass the process, and to toggle between the processed signal and the suppressed or removed portion of the signal. The figure below is the NoNOISE 3 plug-in window. Noted by number, each feature is detailed on upcoming pages.

The NoNOISE 3 DeNoise window

Remember: Save your Estimates and Settings for easy recall.

3.1.1 Preset Buttons, On/Off & Preview

3.1.1.1 Preset Buttons [1]

These four buttons are presets. These presets are useful for taking different Estimates then toggling between them to compare different settings. Presets get saved with the plug-in.

3.1.1.2 Process On/Off Button [2]

The Process On/Off button patches the NoNOISE 3 process in or out of the signal flow. It is useful for comparing the DeNoised processing and the pre-processed signal.

3.1.1.4 Preview NoNOISE Button [3]

Preview toggles the NoNOISE 3 processing to a solo mode where only the noise being removed is heard (Purple= solo mode). Soloing just the noise is useful for adjusting NoNOISE 3 parameters.

3.1.2 NoNOISE 3 Parameters

3.1.2.1 Estimate Name [4]

Displays the current Estimate name.

3.1.2.2 Estimate Save/Open/Reset/Take [5]

The Save button in NoNOISE 3 displays a Save File dialog. Choose a location for the Estimate file, rename it if you wish, then click OK. NoNOISE 3 saves the file, including the Interpolation and Bin Control state, to disk. When red, your Estimate has not been saved and could be lost. Please save all estimates.

The Open button displays a Mac Open File dialog allowing you to select previously-saved Estimate files. Choose the Estimate file you want to open and click OK.

Clicking the Reset button resets the Estimate, Interpolation and Parameters to Default settings.

Clicking the Take button samples the audio that's playing and creates both a noise Estimate (blue line) and an adjustable Interpolation line (grey line).

3.1.2.3 Interpolation Line [6]

Shows the adjustable Interpolation filters, printed when the Take button was pressed.

3.1.2.4 Estimate Line [7]

Shows the noise estimate or individual "fingerprint" of the noise, printed when the Take button was pressed.

The following parameters are available as adjustable parameters (click + hold, mouse up/down):

Parameter	Range	Default Value	Recommended	Extreme
Threshold	-60 to 60	0	n/a	n/a
Reduction	-60 to 0	0	-10 to -24	
Sharpness	0.5 to 2.5	N/A	0.80 to 1.25	> 1.50
Bandwidth	0.5 to 2.5	N/A	1.8 to 2.2	< 1.0
High Cutoff	0 to 24,000 Hz	22050	22050	n/a
Low Cutoff	0 to 24,000 Hz	N/A	50 to 2000	25

3.1.2.5 Threshold [8]

Together with the [9] Reduction parameter, the Threshold parameter provides the basic control over how aggressively the process is applied.

As Threshold is raised, more of the signal at all frequencies is processed. At extremely high settings, a distinctive watery aliasing may be heard in the resulting audio. If the Threshold is set too low, little or no noise reduction is obtained. The Threshold can be thought of as the fine line between noise and music, globally raising or lowering it relative to its original position.

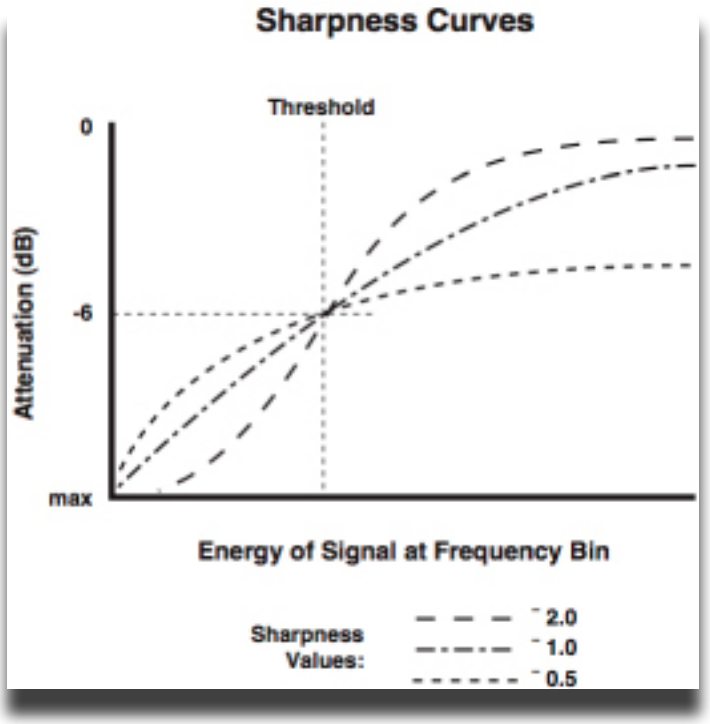
The default Threshold is arbitrary. Threshold and Attenuation settings should generally be adjusted together for best results. The [3] Noise/NoNOISE button can help to determine an acceptable compromise setting.

3.1.2.6 Reduction [9]

This value, in decibels, sets the maximum attenuation to be applied. A setting of 0 produces no noise reduction. The higher or more negative this value is set, the greater the reduction in noise, but with increasing danger of producing audible artifacts in the audio signal. Again, Threshold and Attenuation settings should be adjusted together for best results. Critical listening and use of the Noise/NoNOISE button can help to determine an acceptable compromise setting. If the maximum attenuation setting is too extreme, ambience and/or high frequency content may be lost.

3.1.2.7 Sharpness [10]

As mentioned earlier in the introduction, the denoising process works much like a multiband downward expander. As signal level in a particular band drops, the process reduces the gain in that band even further, using an internal attenuation curve. The Sharpness parameter sets the slope of this curve. Higher values cause quicker attenuation as instantaneous energy falls off from the Threshold value, resulting in a response similar to that of a noise gate.



Sharpness Curves

If Sharpness is set too low, there may be no reasonable amount of noise reduction possible despite what the other parameters are set to. Generally this parameter should be set as high as possible without audible ill effects on the program. A value of 1.0 is recommended for common tape hiss problems, while a value of about 1.2 has been found useful for standard 78 RPM phonograph recordings. If the sharpness is too high, you may hear the noise floor become less uniform, producing a rapid modulation.

3.1.2.8 Settings Save/Open/Recall [11]

3.1.2.9 Bandwidth [12]

Denoising with each Bin adjusted separately produces an unnatural sounding result. In Broadband DeNoise, individual Bins share information for more pleasing subjective result. Bandwidth governs the process of how the different frequency bands in this plug-in 'share' information. Higher values produce more intra–frequency sharing of gain changes. Subjectively, a higher value will, in general, create a more natural sounding result but, with a risk of noise floor modulation. A low value for Bandwidth eliminates the possibility of noise pumping, but may sound more muffled. Low values command little sharing while higher values command more sharing. As with other Broadband DeNoise settings, experiment for the best compromise setting. This depends entirely on the program material and should be set high enough to retain high frequency response but low enough to avoid pumping or distortion caused by the noise floor being modulated by the high order harmonics of a signal.

3.1.2.10 High Frequency Cutoff [13]

The DeNoiser lets signal in frequencies above the high frequency cutoff point pass through the process untouched. That is, they are not processed. This limits processing to frequencies below

the high cutoff point. This can be used in situations where noise is not objectionable above a certain frequency, but in most cases, this parameter is left set at 22,050 Hz.

In special cases, better results may be obtained by processing your program in two passes, with a low frequency pass and a high frequency pass run separately, using different parameter values. Run your program material through Broadband DeNoise twice, using the low and high cutoff frequencies to define the two bandpass ranges to be noise reduced.

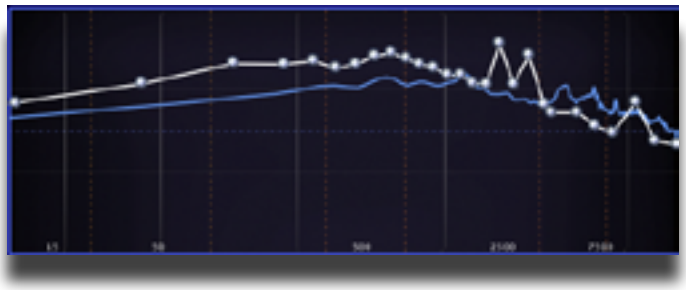
3.1.2.11 Low Frequency Cutoff [14]

This parameter, the complement to the High Frequency Cutoff parameter discussed in the section above, allows signal below the specified frequency to pass through unchanged. This can be useful if noise is not objectionable below a certain frequency and you wish to leave it unprocessed. Low Frequency Cutoff is usually left set around 50-100 Hz though setting it at 2.5 kHz or above will ensure that the critical midband will remain untouched. If this parameter is lower than 25 Hz, there may be artifacts because program wavelengths will exceed the analysis "window."

3.2 Using The DeNoiser

To suppress such noises in your program, it is necessary to analyze the noise spectrum and adapt the denoising algorithm to the characteristics of the material. Broadband DeNoise operates by means of analysis and resynthesis, though it can be thought of as a lot of bandpass filters, each followed by a below–threshold expander. This is somewhat analogous to the classic analog Dolby and dbx multi–band, double–ended noise reduction systems of yore.

An FFT or Fast Fourier Transform analysis is performed on a user–specified sample of noise from the material to be processed. The average amplitude of noise in each of 2048 individual frequency bands or "bins" is determined. The result of this analysis is a "Noise Estimate," which is used to set the average threshold of the noise reduction. The Estimate sets aggregate threshold for the expansion.



During processing, the source material is also subjected to a 2048 point FFT analysis. The average amplitude of signal in each bin is compared against the threshold value determined by the noise Estimate. Based on this comparison, the algorithm determines whether a given band at that particular instant contains audio signal or only noise.

If a frequency bin is found to be at or above threshold, its gain remains at unity. If it is determined that the signal amplitude in that band falls below threshold, then it is considered "noise" and the amplitude of that band is reduced by an amount determined by the Attenuation parameter, discussed later. The results of this comparison and amplitude compensation for all bands is a modified version of the original FFT frequency analysis. A reverse FFT is then performed using the new, adjusted version, reconstituting the audio signal with aggregate noise attenuated by the specified amount. Because NoNOISE 3 operates with high frequency resolution and at extended precision, the removal of noise is precise and artifact–free.

3.2.1 The Noise Estimate

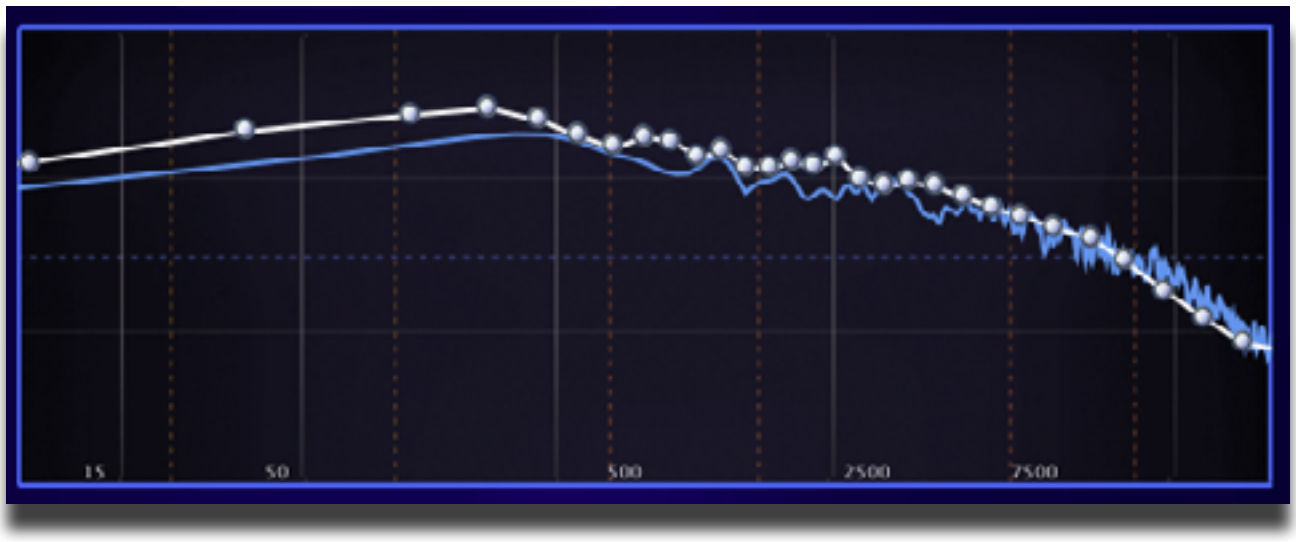
The first step in denoising is to derive a Noise Estimate from the material to be processed. The Noise Estimate, or simply Estimate, is an individual "fingerprint" of the noise and determines local threshold values for each frequency bin. The NoNOISE 3 user interface provides a group of commands for creating, processing, editing and storing the Estimate. The Estimate determines the result of the entire denoising process, so it is important to ensure that the estimate taken is valid and represents the true noise floor of the source sound file.

3.2.1.1 Noise Estimates

The procedure for taking a usable Estimate has several steps. First, open the source sound file into either soundBlade or your audio software, then open the NoNOISE 3 plug-in. Next, identify a short section of audio where there is only noise or predominantly noise. About 0.3 to 0.5 seconds is sufficient. Set the playback cursor to a few seconds before the section you've identified as noise. Start playback, and as the play head move over the noise segment, press the Take button

once. That action automatically interpolates the Estimate, applying "Bin Controls," which are individual threshold controls for separate regions of the frequency spectrum, and writes that Estimate into the Estimate Window. Section 1.2.2.2 below discusses where to take a Estimate in detail.

Save Your Estimates!



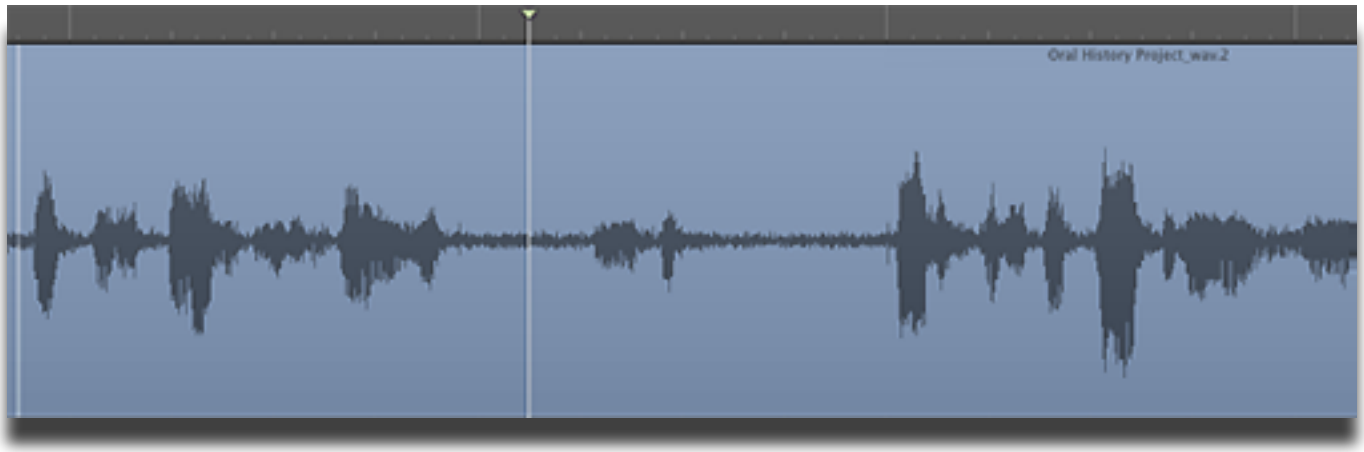
An Noise Estimate (Blue Line) with adjustable Interpolation Bin Control Dots

At this point, you now have an Estimate Window with a blue "Interpolation" line with grey Bin Controls attached. Select the Save button

to save the Estimate as a file that will be used by the NoNOISE 3 processor.

3.2.1.2 Where to take an Estimate

Once the source sound file is opened into your audio app., the first step is to identify a suitable location from which to take the Estimate. Since the denoising algorithm depends on a constant amplitude and spectrum in the noise floor, try to listen and locate a time region with uniform noise. As to duration, optimum results are obtained when the Estimate is taken from a section of pure noise between about 0.3 and 0.5 seconds in length, with a worst case minimum of 100 milliseconds.



Where To Take A Noise Estimate

If a region of pure or "clean" noise, noise uncontaminated with program, is unavailable as is often the case with tightly edited material, then choose a region with minimal program. The resulting Estimate will require manual adjustment as discussed below. If an Estimate must be taken in presence of signal, it is advisable to avoid sections of spectrally complex or non–harmonic material as it makes manual adjustment more time consuming.

It is usually necessary to derive a separate Estimate for each cut or take. If these are contained in a consolidated sound file and the spectrum of the noise varies for each cut, then the consolidated file should be denoised in sections, so that the optimal combination of estimate and parameters can be applied to each cut.

Unless there is strong reason to believe that each cut in a compilation or consolidated file was:

1. recorded in the same session with the same equipment
2. at precisely the same levels onto the same media
3. stored in the same way
4. transferred to the same intermediate media in precisely the same way
5. and converted to digital samples in the same signal chain

then it is advisable to take separate estimates for each cut or take. When denoising stereo material, it is also recommended to derive a separate Estimate for each channel. Likewise, if the character or level of the noise floor can be heard to change at all during the recording, then the best results are be obtained by dividing that piece into sections to be denoised individually. After denoising, the individual sections can edited together and sequenced to create a seamless whole.

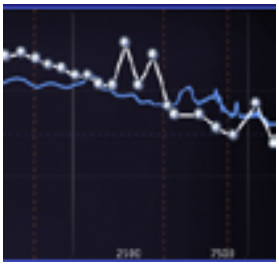
Learn: Try to listen and locate a region of your file with uniform noise and use this for your Estimate. As to duration, optimum results are obtained when the Estimate is taken from a section of pure noise between about 0.3 and 0.5 seconds in length.

3.2.1.3 Post–processing an Estimate

After taking an estimate, the Estimate Panel changes to show the Estimate, a Fast Fourier Transform (FFT) indicated as a blue line. After deriving the Estimate, NoNOISE 3 performs a best fit approximation from the composite FFT data, displaying it as a smoothed grey spline connecting a series of dots, the Bin Controls mentioned above, superimposed on the composite FFT.

Analog tape hiss has a characteristic noise curve or shape. NoNOISE 3 takes advantage of this property to produce a smooth Interpolation from any individual region of the Estimate based on that region's average amplitude. Make a time region selection of a portion of the Estimate that appears to be outside the range of the contaminating audio program.

3.2.1.4 Editing an Estimate

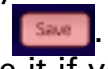


The Estimate technique works well for recordings containing typical tape hiss or other steady-state noise, but many recordings have other noise sources or peculiarities. In such cases, it is often necessary to manually adjust the Interpolation, differentiating between the desired program content and the noise floor.

To edit an Interpolation, drag a Bin Control (Grey Dot) up or down. If, for example, a number of piano harmonics are contaminating the Estimate, the Bin Controls can be moved down so that the Interpolation follows the average amplitude rather than the local amplitude. Moving a Bin Control down will command a lower threshold and cause less sensitivity in that Bin, resulting in less noise reduction while moving a Bin Control up sets a higher threshold, causing more noise reduction.

LEARN: Moving Bin Controls down will decrease the amount of reduction. Moving a Bin Control up will increase the amount of reduction.

3.2.1.5 Saving an Estimate

Once you are satisfied with the Interpolation, you need to save it. To do so, select the red Save button 

. NoNOISE 3 displays a Save File dialog. Choose a location for the Estimate file, rename it if you wish, then click OK. NoNOISE 3 saves the file, including the Interpolation and Bin Control state, to disk.

3.3 Workflow recommendation:

LEARN The operation of the NoNOISE 3 is a subjective process – there is no single 'correct' setting – only your hearing can decide. In general though, if too much program is present in the suppressed signal, then you are probably using Threshold or Attenuation settings that are too aggressive. Also, it's fairly easy to misinterpret noise as high frequency content so, critical listening with a wide-band speaker system or quality headphones are required for proper operation.

3.3.1 NoNOISE 3 For soundBlade - Four Steps To Follow

1) Define small sample of noise - generally 1/2 second is good. Set an Edit Point by clicking a second or two before the noise.

2) Play the file from the Edit Point and press the Take button during the segment you defined as noise. Save that estimate that appears.

You can take multiple estimates in the 1, 2, 3, 4 filter banks and save them. This is useful for content that may have different noise content throughout the file, then applying automation as Desk Events.

3) Adjust Interpolation Bins to taste. Use the NoNoise In/Out button to compare processed vs. original.

4) Export your files to apply NoNOISE 3 processing. Note that NoNOISE 3 is a non-destructive process. It does not alter your original files.

In soundBlade, NoNOISE 3 can be used as either:

- a desk event for use on segments or a selection
- in the Meters window for global processing

- or -

- in the EDL Desk to apply to an individual track

3.3.2 NoNOISE 3 For Other Apps That Support Audio Units or VST Plug-Ins - Four Steps To Follow

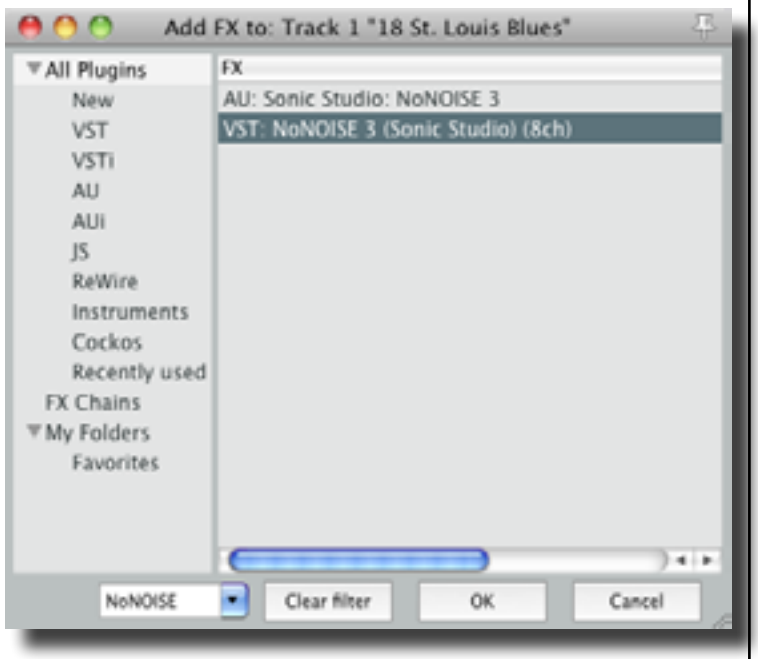
Please refer to your Digital Audio Workstation's documentation for how to use plug-ins. NoNOISE 3 will operate like other plug-ins used in your workstation. Here is how to use it:

1) Define small sample of noise - generally 1/2 second is good. Set your audio app to play a second or two before the noise.

2) Play the file and press the Take button during the segment you defined as noise. Save that estimate that appears.

You can take multiple estimates in the 1, 2, 3, 4 filter banks and save them. This is useful for content that may have different noise content throughout the file, then applying automation.

3) Adjust Interpolation Bins to taste. Use the NoNoise In/Out button to compare processed vs. original.

In Digital Performer:	In Logic:	In Reaper:
		

Chapter 4..... Contacting Sonic Studio, LLC

Thanks for purchasing a Sonic Studio product. We really appreciate your patronage and are always interested in your experiences with our software.

4.1 For frequently-asked questions (FAQ) and searchable KnowledgeBase

www.sonicstudio.com/sonic/support/sonic_support

4.2 For bug reports and support issues

www.sonicstudio.com/sonic/support/sonic_portal

4.3 For up-to-date information on all of Sonic Studio's products

www.sonicstudio.com/products

4.4 Software Updates

Updates to soundBlade HD are available in the Downloads section of the Sonic Studio website.

http://www.sonicstudio.com/sonic/support/sonic_support#DOWNLOAD

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